Flash Economics

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Does the reduction of greenhouse gas emissions lead to a loss of growth?

This is a very important question: does the reduction of greenhouse gas emissions inevitably lead to low growth? We do not believe so, because:

- Countries that are significantly reducing their CO_2 emissions further exhibit strong growth (United States, Spain, Denmark, etc.);
- The cost of renewable energy is not higher than that from fossil fuels;
- Reducing CO_2 emissions does not require a reduction in energy consumption in countries where the share of renewable energy has increased significantly;
- Growth is actually not correlated with the share of renewables, but with R&D spending and investment in new technologies.

In reality, renewable energy is an easy substitute for fossil fuels, which prevents the reduction in fossil fuel use from necessarily leading to a decline in growth. On the contrary, climate change would lead to a significant drop in gross domestic product. A. Bilal and D. Känzig[1] show that a 1°C increase in global temperature would reduce global GDP by 12%.

Patrick Artus
Senior Economic Advisor
patrick.artus-ext@ossiam.com
@PatrickArtus
Patrick Artus

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1. Bilal, A., & Känzig, D. R. (2024). *The macroeconomic impact of climate change: Global vs. local temperature* (No. w32450). National Bureau of Economic Research.

We do not believe that the reduction of greenhouse gas emissions inevitably leads to a decline in growth

1. The first observation that can be made to show that the reduction of greenhouse gas emissions does not necessarily result in low growth is that **there are many countries where a significant decrease in CO_2 emissions is accompanied by sustained economic growth**.

Examples include the United States (**Chart 1A**), Spain (**Chart 1B**), and the Netherlands (**Chart 1C**).

Chart 1A
United States: Evolution of CO_2 emissions and GDP (2002 = 100)

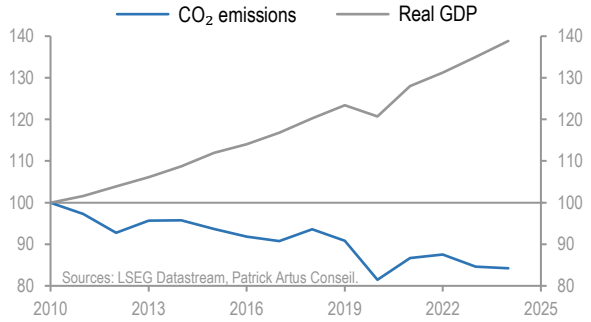


Chart 1B
Spain : Evolution of CO_2 emissions and GDP (2002 = 100)

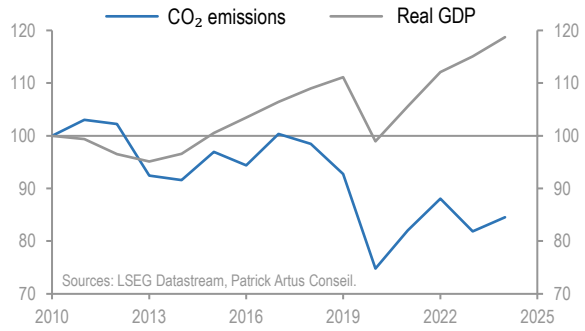
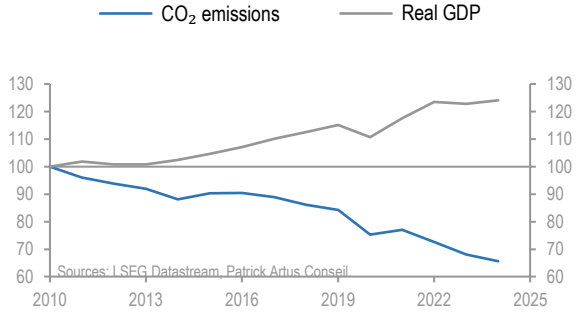


Chart 1C
Netherlands : Evolution of CO_2 emissions and GDP (2002 = 100)



2. **The price of renewable energy is not higher than that of fossil fuels** (**Table 1**).

Table 1 shows that renewables (solar, wind) are not a more expensive source of energy than fossil fuels (natural gas, coal).

Table 1 : United States : Electricity generation costs by technology (Levelized cost of energy, in $/MWh)

	2025
Nuclear	141-220
Fully depreciated nuclear power	34
Coal	71-173
Gas	48-107
Solar PV	38-78
Wind onshore	44-123
Wind offshore	70-157

Source: Lazard

3. **The reduction of CO_2 emissions does not require a reduction in energy consumption in countries where the share of renewable energy increases significantly**.

We can take as examples countries where the share of renewables has grown substantially: Denmark (the share of renewables in energy consumption rose from 8% in 2002 to 42% in 2023), Portugal (from 9% in 2002 to 36% in 2023), and Sweden (from 32% in 2002 to 54% in 2023). In Sweden, the combined share of nuclear and renewable energy increased from 61% in 2002 to 80% in 2023.

For these three countries, we observe **the evolution of total energy consumption and CO_2 emissions** (**Charts 2A/B/C/D/E/F**).

Chart 2A
Denmark: Proportion of renewable energy in energy consumption (%)

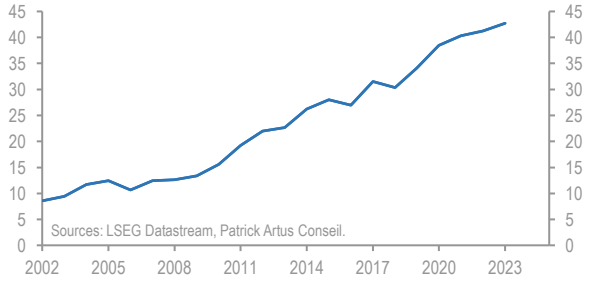


Chart 2B
Denmark : Evolution of energy consumption, CO_2 emissions, and GDP (2002 = 100)

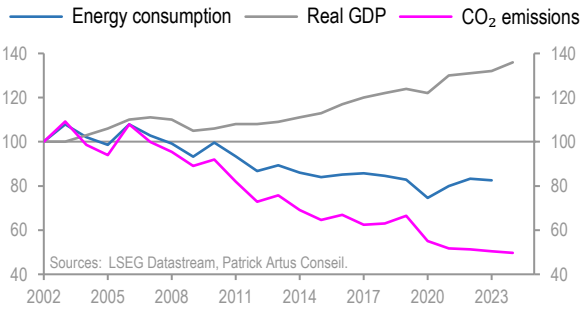


Chart 2C
Portugal: Proportion of renewable energy in energy consumption (%)

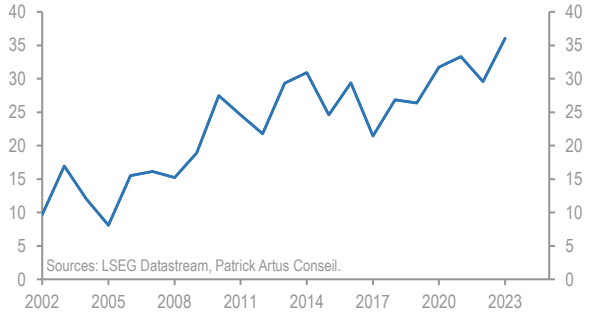


Chart 2D
Portugal: Evolution of energy consumption, CO_2 emissions, and GDP (2002 = 100)

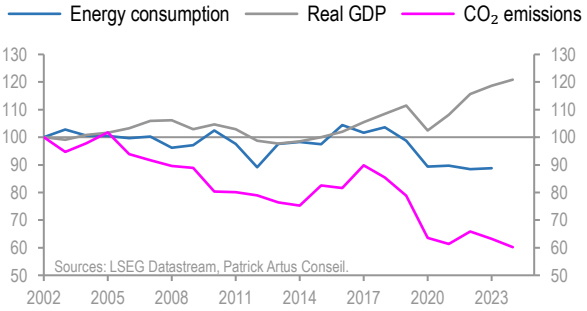


Chart 2E
Sweden: Proportion of non-fossil energy (renewables and nuclear) in energy consumption (%)

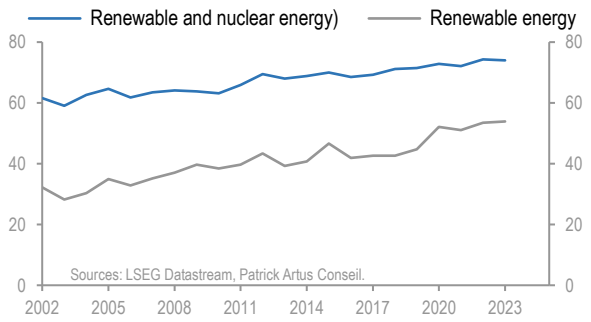
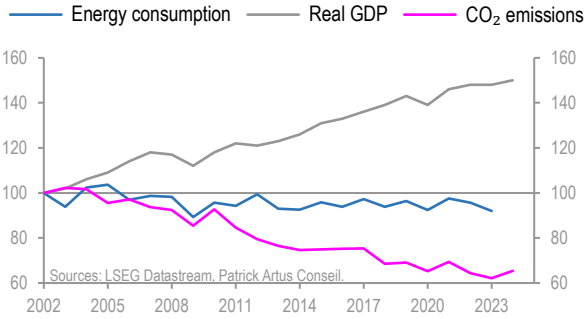


Chart 2F
Sweden: Evolution of energy consumption, CO_2 emissions, and GDP (2002 = 100)



It is clear that **the development of renewables makes it possible to achieve both a substantial energy supply and a significant reduction in CO_2 emissions**.

4. **In reality, weak growth—such as that observed in the euro area compared to the United States—stems from low levels of investment in new technologies and insufficient spending on research and development**.

Chart 3A shows the evolution of **real GDP** since 2002 in the United States and the euro area; **Chart 3B** illustrates the trend in **investment in new technologies**; and **Chart 3C** presents the evolution of **total research and development spending**.

Chart 3A
Real GDP (100 = 2002.Q1)

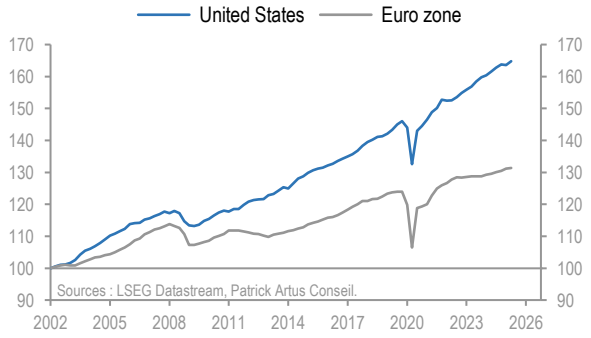


Chart 3B
ICT investment including software
(in value terms, as % of nominal GDP)

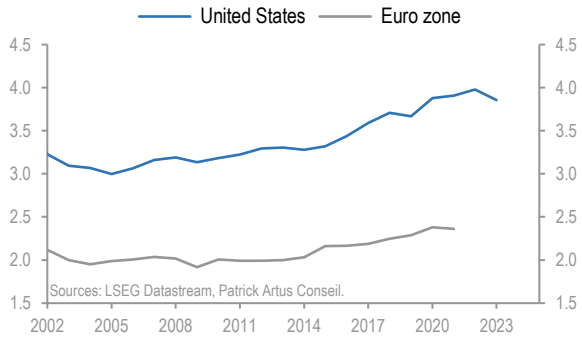
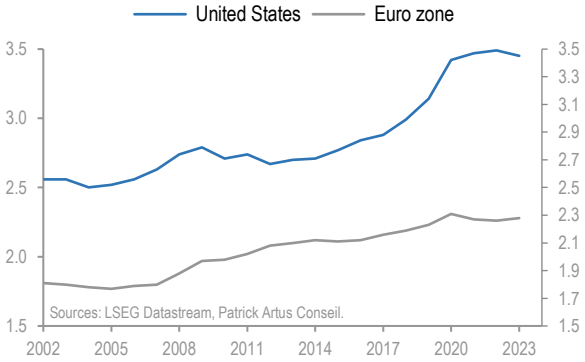


Chart 3C
Total R&D spending (as % of nominal GDP)



Summary: What do we observe overall?

We observe that **renewable energy is an easy substitute for fossil fuels**. Transitioning from fossil fuels to renewable energy can therefore occur without causing a significant decline in economic growth. On the other hand, limited investment in new technologies and research and development proves to be very costly in terms of growth.

Recent research (Bilal-Känzig, as cited in the introduction) even shows that **allowing significant global warming to take place would have a very negative impact on growth** (a 12% loss in global GDP for every 1°C increase in global temperature).

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